

Docket No. BPHOTO.003

CLAIMS:

What is claimed is:

- 5 1. An integrated laser diode system, comprising:
a first waveguide having a first reflector at a
first end of the first waveguide and a second reflector
at a second end of the first waveguide and an outcoupling
aperture positioned to outcouple light at a location
10 between the first reflector and second reflector of the
first waveguide;
a second waveguide having a reflector at a first end
of the second waveguide, wherein a second end of the
second waveguide is optically coupled to the first
15 waveguide;
a third waveguide having a reflector at a first end
of the third waveguide, wherein a second end of the third
waveguide is optically coupled to the first waveguide;
wherein photons generated in the second and third
20 waveguides are coupled into the first waveguide and
emitted through the outcoupling aperture.

2. The integrated laser diode system of Claim 1,
wherein the second waveguide has a first electrical
25 contact positioned to apply a voltage across a first
region of the second waveguide, and wherein the second
waveguide has a second electrical contact positioned to
apply a voltage to the second end of the second
waveguide.

Docket No. BPHOTO.003

3. The integrated laser diode system of Claim 2,
wherein the third waveguide has a first electrical
contact positioned to apply a voltage across a first
region of the third waveguide, and wherein the third
5 waveguide has a second electrical contact positioned to
apply a voltage to the second end of the third waveguide.

4. The integrated laser diode system of Claim 1,
wherein photons are generated in the second waveguide by
10 applying a first voltage to a gain region of the second
waveguide, and wherein the degree of coupling of the
second waveguide to the first waveguide is controlled by
applying a second voltage to the second end of the second
waveguide.

15 5. The integrated laser diode system of Claim 1,
wherein the second end of the second waveguide and the
second end of the second waveguide are optically coupled
to the first waveguide by evanescent coupling.

20 6. The integrated laser diode system of Claim 1,
wherein the first reflector of the first waveguide and
the second reflector of the first waveguide are
distributed Bragg reflectors.

25 7. The integrated laser diode system of Claim 1,
wherein a grating is positioned between the first
waveguide and the second waveguide to facilitate coupling
of light from the second waveguide into the first
30 waveguide.

Docket No. BPHOTO.003

8. A laser diode system, comprising:

5 a first cavity comprising a first waveguide having a first reflector at a first end of the first waveguide and a second reflector at a second end of the first waveguide, the first cavity having a first section with an outcoupling aperture;

10 a second cavity comprising a second waveguide and a third waveguide and the first section of the first cavity, the second waveguide having a third reflector at a first end of the second waveguide, and the third waveguide having a fourth reflector at a first end of the third waveguide; and

15 wherein the second waveguide is optically connected to the first cavity at a first end of the first section of the first cavity, and wherein the third waveguide is optically connected to the first cavity at a second end of the first section of the first cavity.

20 9. The laser diode system of Claim 8, wherein light emitted from the first cavity is modulated by varying a voltage applied to a section of the first cavity.

25 10. The laser diode system of Claim 8, wherein the outcoupling region includes an outcoupling grating; and

wherein the outcoupling grating has a period which is an integer multiple of the wavelength of light generated in the first cavity, but not an integer multiple of the light generated in the second cavity.

Docket No. BPHOTO.003

11. The laser diode system of Claim 8, wherein the second and third waveguides are optically connected to the first cavity through evanescent coupling.

5 12. A laser diode system, comprising:

a first cavity comprising a first waveguide;

a second cavity, the second cavity comprising a second waveguide and a third waveguide and a first section of the first waveguide;

10 wherein the second waveguide is coupled to the first waveguide through evanescent coupling at a first end of the first section of the first waveguide, and the third waveguide is coupled to the first waveguide through evanescent coupling at a second end of the first section
15 of the first waveguide;

wherein photons generated in the first cavity are outcoupled through an outcoupling aperture, the outcoupling aperture being positioned in the first section of the first waveguide; and

20 wherein photons generated in the second cavity are outcoupled through the outcoupling aperture.

13. The laser diode system of Claim 12, wherein the photons generated in the first cavity are of different
25 wavelength than the photons generated in the second cavity.

14. The laser diode system of Claim 12, wherein the second waveguide has a first contact electrically
30 connected thereto to inject current into a gain region of

Docket No. BPHOTO.003

the second waveguide, and a second contact electrically connected thereto to vary optical properties of the second waveguide

- 5 15. A laser diode system, comprising:
a first cavity optically coupled to a second cavity by evanescent coupling at a coupling region;
wherein the first cavity has a first electrical contact and a second electrical contact; and
10 wherein the first electrical contact is used to generate photons in an active region of the first cavity, and the second contact is used to vary the optical properties in the coupling region of the first cavity.

- 15 16. The laser diode system of Claim 15, wherein the coupling of the first cavity to the second cavity is assisted by a grating.

17. A laser diode system, comprising:
20 a cavity made from a first waveguide, a second waveguide, and a third waveguide, the first and second waveguides coupled to the third waveguide through evanescent coupling;
wherein the laser diode system outputs at least two
25 different wavelengths of light through a single outcoupling aperture.

18. The laser diode system of Claim 17, wherein the outcoupling grating is located on the third waveguide.

Docket No. BPHOTO.003

19. The laser diode system of Claim 17, wherein the coupling of the first waveguide and the coupling of the second waveguide to the third waveguide are grating assisted couplings.

5

20. The laser diode system of Claim 17, wherein the outcoupling aperture comprises an outcoupling grating and a coupling lens which alters the path of at least some of the outcoupled photons.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52